Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A gyroscopic system for translating parallel and non-parallel lines between a reference line and a device to be aligned with respect to the reference line, comprising:

a first inertial sensor configured to be substantially stationary, said first inertial sensor comprising a first three-axis gyroscopic sensor configured to produce an output signal and a reflector;

a second inertial sensor configured to be portable so as to be positionable adjacent to said first inertial sensor and comprising a gimbal restricted to two physical axes, a gimbal drive system, an electromagnetic energy beam generator, a second three-axis gyroscopic sensor configured to generate an output signal, and a collimator, said collimator being operable to determine an angle between a beam projected by said beam generator and a beam reflected from said reflector and to generate an output signal indicative of said determined angle; and

a control circuit operable to process output signals generated by said collimator and said first and second three-axis gyroscopic sensors and determine relative orientations of said first and second inertial sensors with respect to each other.

2. (Original) The system of claim 1, wherein the control circuit outputs a control signal to the gimbal to hold it in a fixed orientation with respect to the first inertial sensor.

3. (Original) The system of claim 1, further comprising a display unit receiving operator input and communicating with the control circuit.

4. (Original) The system of claim 1, further comprising an adapter coupled to the first inertial sensor for mounting the first inertial sensor to a vehicle and configured to hold the first inertial sensor at a predetermined angle offset from said reference line.

5. (Original) The system of claim 4, wherein the control circuit is operable to determine the relative orientations of said first and second inertial sensors with respect to each other taking into account the predetermined angle offset.

6. (Original) The system of claim 1, further comprising:
a second reflector mountable on advice at a predetermined angle offset from the reference line; and wherein said second inertial sensor is configured to generate an output signal indicative of said determined angle and to determine a second angle between a beam projected by said beam generator and a beam reflected from the second reflector to generate an output signal indicative of said second angle.

7. (Original) The system of claim 6, wherein said a control circuit is operable to use said gyroscope output signals and data relating to the position of said gimbal relative to said reference line to determine the orientation of said device with respect to said reference line.

8. (Original) A method for aligning a device with respect to a reference line by transferring parallel and non-parallel lines, comprising the steps of:

aligning a stationary inertial sensor with respect to said reference line;

projecting an electromagnetic beam from a portable inertial sensor to a mirror coupled to said stationary inertial sensor and detecting the angle of the reflected beam;

determining the relative position of said portable inertial sensor with respect to said stationary inertial sensor using the detected angle and output data from each of a pair of gyroscopic sensors

provided in said stationary and said portable inertial sensors;

aligning said portable inertial sensor with respect to said device; and

calculating the position of said device with respect to said reference line using said detected angle and said output data.

9. (Currently Amended) A method for determining a reference coordinate ~~system~~ frame, comprising:

a) determining a unit vector in a base frame for each of first and second reflecting surfaces, wherein the unit vector is normal to the reflecting surface;

b) determining a reference frame based on the unit vectors;

c) transforming the reference frame to compute a station measurement in the base frame.

10. (Original) The method of claim 9, wherein b) comprises:

combining the unit vectors to obtain a mirror frame; and

rotating the unit vectors to obtain the reference frame.

11. (Original) The method of claim 9, further comprising converting the station measurement to a selected format.

12. (Original) The method of claim 11, wherein the format is one of Eulerian, DCM, or quaternion format.

13. (Original) The method of claim 9, further comprising representing the reference frame as a direct cosine matrix.

14. (Original) The method of claim 13, wherein a first row of the matrix is the unit vector for the first reflecting surface, a third row of the matrix is a normalized cross-product of the unit vector for the first reflecting surface into the unit vector for the second reflecting surface, and a second row of the matrix is a normalized cross product of the third row into the second row.

15. (Original) A method for reference sighting, comprising:

a) determining a nominal mirror line in a base frame for each reference mirror;

b) measuring a first measurement vector for the first reference mirror;

c) logging an orientation of the first gyro and the second gyro at the time of the measuring;

d) converting the measurement vector to quaternion form;

e) computing an actual mirror line with respect to the nominal mirror line;

f) virtually de-rolling the orientation of the second gyro; and

g) causing the optical reference line to converge on the nominal mirror line.

16. (Original) The method of claim 15, further comprising repeating b)-f) for each mirror.

17. (Original) The method of claim 15, further comprising verifying the measured position correlates with the expected position.

18. (Original) The method of claim 17, further comprising repeating the mirror measurement if the measured position does not correlate with the expected position.

19. (Original) A method for aligning a device comprising:
aligning a stationary inertial sensor with respect to said reference line;

projecting an electromagnetic beam from a portable inertial sensor to a mirror coupled to said stationary inertial sensor and detecting the angle of the reflected beam;

determining the relative position of said portable inertial sensor with respect to said stationary inertial sensor using the detected angle and output data from a first gyroscope provided in said stationary inertial sensor and a second gyroscope provided in said portable inertial sensor; and

controlling a two-axis gimbaled platform carrying circuitry for generating the electromagnetic beam to orient the platform.

20. (Original) The method of claim 19, further comprising calculating the position of said device with respect to said reference line using said detected angle and said output data.

21. (Original) The method of claim 19, further comprising:

mounting the first inertial sensor to the device at a predetermined angle offset from said reference line; and

determining the relative orientations of said first and second inertial sensors with respect to each other taking into account the predetermined angle offset.

22. (Original) The method of claim 19, further comprising:

receiving a trigger signal from an operator; and

using an orientation of the second inertial sensor as a starting position for an optical search.